

apparently constituted the first example of this species to have reached Britain, the type (a juvenile) having been sent to the Leiden Museum by Pel, provided by Temminck and described by Hartlaub in 1855. An accurate colour lithograph by Keulemans illustrates Sharpe's paper. For reasons now unclear, four years later Sharpe (1874) considered the colour difference to be sex related, with the grey morph being male, the chestnut form female. This was repeated by Reichenow (1901). Bannerman (1930) mentions having examined the melanistic specimen from the Norwich Museum and gives a description of it ("breast and belly entirely grey, a faint indication of reddish-brown feathers appearing on the throat and here and there on the breast"). He does not mention, however, the existence of this morph in the shorter, two-volume version of his work (Bannerman 1953). It is not mentioned either by Bates (1930), Lippens & Wille (1976), Mackworth-Praed & Grant (1952), Serle, Morel & Hartwig (1977), Snow (1978) and Williams & Arlott (1980). In the forty years between Bannerman (1930) and Mackworth-Praed & Grant (1970), Schouteden (1954) seems to be the only author to make explicit reference to it, stating that "the breast is sometimes grey". Not to mention it is, of course, not to deny its occurrence—one might infer that in some cases lack of space or superficial treatment may have precluded mention. This seems, however, to have had the unfortunate result of leading others at least to overlook or ignore its existence.

Thus, Brown *et al.* (1982) describe the underparts of the adult as being wholly chestnut, and do not mention the melanistic morph. This is surprising, however, because Mackworth-Praed & Grant (1970) clearly state that the underparts may be either chestnut or blackish slate and include a colour illustration of both morphs. It is even more remarkable in view of the fact that the principal author of the former, in another major work (Brown & Amadon 1968), illustrates both colour morphs in a plate but, curiously, omits any mention of the melanistic phase in the text. Recently Kemp (1994), although mentioning that "a melanistic morph has been claimed to exist and even been depicted", has gone so far as to conclude that this was "apparently unsubstantiated".

The Natural History Museum (Tring) holds 23 adult specimens of which two are grey morphs. One specimen (reg. no. 1955.6.N20.3245) was that originally held in the Norwich Museum and illustrated in Sharpe's paper (it bears a label to this effect). Locality data are given simply as Denkera, Fantee County [Ghana]. The second specimen (reg. no. 1938.4.6.3) was collected on 18 January 1938 at Ondo, Nigeria. No other data are given. Among the 21 adult specimens in the Royal Museum for Central Africa (Tervuren, Belgium), all except one of which are from the Lower Guinea forest block in former Zaïre, no grey morphs are present. Neither of the grey specimens in Tring is sexed, making Sharpe's (1874) claim for the dimorphism being sex-linked the more intriguing. Brown *et al.* (1982) state that females average larger than males, although the measurements they give are for both sexes combined. The range for wing length is stated to be 266–310 mm (sample size unspecified). Wing lengths of the grey

individuals from Ghana and Nigeria measured 305 and 268 mm respectively. While not conclusive this might be taken to suggest that the grey morph occurs in both sexes.

In Ivory Coast, the Long-tailed Hawk is not uncommon in Yapo Forest, 5°42'N 4°6'W (Demey & Fishpool 1994). Although we regularly heard the species there, we rarely saw it. Indeed, during 167 visits to Yapo forest over the course of five years we observed the Long-tailed Hawk on 18 occasions only, involving 22 individuals: two of these were seen to be melanistic birds, although the proportion could have been slightly higher since in some cases (number unrecorded) the observations concerned rear views of birds in flight. Brief details of these sightings are as follows. On 25 May 1986, RD observed a bird corresponding to the description of the melanistic morph (Mackworth-Praed & Grant 1970). The bird crossed a clearing at less than 10 m from the observer, and landed in a tree. It was not shy, allowing close and detailed observation through a telescope of 20× magnification during more than 15 minutes. Notes taken on the spot describe the underparts as slate-grey, concolorous with the upperparts; upper- and undertail-coverts pure white; tail very long, black with white spots, looking somewhat worn; underwing barred. Eye yellow; bill greyish-black; legs yellow. A second melanistic individual was seen under similar circumstances at a different locality in Yapo by LDCF on 14 February 1988. The plumage description taken at the time matches the foregoing exactly. The only addition was that the cere of this individual was noted as grey.

Another record of this morph has been documented from the Lower Guinea forest block, in Gabon. Brosset & Erard (1986) report a sighting, in April 1985, of a 'mixed' pair, of which one of the birds showed uniformly grey underparts.

It thus appears that the claims of the existence of a melanistic morph of the Long-tailed Hawk are indeed well founded.

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Food delivery and chick provisioning in cypseloidine swifts

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Swifts (Apodidae) catch all of their arthropod food on the wing. These items, mostly insects, are brought back to nestlings in two strikingly

different ways which in turn affect the kind of food adults capture, their foraging range and chick provisioning rate.

Swifts and swiftlets in the subfamilies Chaeturinae and Apodinae bring the food items back to nestlings in a consolidated mass or bolus glued together with saliva and carried in the mouth. For *Apus apus*, an individual bolus typically weighs 0.70–1.75 g, occasionally 2.0–2.5 g (Lack & Owen 1955, Martins & Wright 1993), and contains 90–850 individual prey items (Lack & Owen 1955, Collins unpublished). A bolus can contain as many as 1500 very small insects such as aphids (Homoptera, Aphididae) (Lack & Owen 1955). Although food boluses can occasionally consist of only one or a few types of insects, they typically contain representatives of numerous orders and families of insects and ballooning spiders (Hespenheide 1975, Collins 1968, Tarburton 1986a, Bull & Beckwith 1993). The food bolus causes a visible distension of the floor of the mouth which is observable in swifts returning to feed nestlings (Lack 1956, Arn-Willi 1960, Cramp 1985). The adult inserts its bill into the open mouth of the begging chick (Lack 1956, Arn-Willi 1960) and usually passes most or all of the bolus to a single older chick; the bolus may be divided among several very small chicks (Lack & Lack 1951). Swifts are efficient foragers and can rapidly gather a bolus of food. Lack & Lack (1951) report individual *Apus apus* gathering 1.2 g and 1.7 g of insects in 47 and 64 minutes respectively. Feeding rates in the Chaeturinae and Apodinae are highly variable, ranging from 3–4 feedings per hour to 4.6–10.7 feedings per 10 hours (Moreau 1942a,b, Lack & Lack 1951, Collins 1968, Tarburton 1986b, Bull & Collins 1993). Feeding rates are correlated with both brood size and weather-related differences in food abundance (Lack & Lack 1951, Lack & Owen 1955, Tarburton 1986b). The mode of food delivery, boluses carried in the mouth, directly limits the amount of food which can be brought back per feeding trip and, indirectly, the effective foraging range. It would be inefficient for such birds to expand their foraging range to the extent that excessive time and energy are spent in transport of individual boluses from distant foraging areas. The Ecological Cost of Transportation (Garland 1983) or “percent of total daily energy expenditure which is consumed by locomotion” to and from foraging areas (Whitacre 1992) would become unacceptably high. Additional theoretical discussion of foraging efficiency in birds and the trade-offs between load size and foraging distance is presented by Krebs & Davies (1993).

The 12–13 species of New World swifts in the genera *Cypseloides* and *Streptoprocne* (Sibley & Monroe 1990, Chantler & Driessens 1995) have many distinctive morphological and breeding characteristics warranting their separation as the subfamily Cypseloidinae (Brooke 1970). Included is their tendency to nest in dark damp locations, frequently near or behind waterfalls (Knorr 1961, Snow 1962, Collins 1968, Marin & Styles 1992). It has also been noted that the rate of food delivery to chicks is notably low. In the Chestnut-collared Swift *Cypseloides rutilus*, feeding intervals were usually longer than 100 minutes (Collins

1968). Similarly, in the Black Swift *Cypseloides niger* Michael (1927) noted several hours between feedings and possibly only a single feeding late in the day or at dusk. The larger White-naped Swift *Streptoprocne semicollaris* and White-collared Swift *Streptoprocne zonaris* also appear to make only a single feeding trip to the nest per day (Whitacre 1992).

Another subfamilial difference which has not been given attention is the mode of food delivery to chicks. The cypseloidine swifts do not carry food for the chicks as a saliva-coated bolus in the mouth, but as an unconsolidated mass in the oesophagus. The distended oesophagus in White-naped and White-collared Swifts was 100–135 mm long, 26 mm in diameter, and contained 538–1078 insects 80.7% of which were flying ants (Formicidae: *Azteca*, *Solenopsis*) (Rowley & Orr 1962, 1965). There also appeared to be a “fringed valve situated immediately behind the glottis” (Rowley & Orr 1962). The mean weight of the oesophagus contents of White-collared and White-naped Swifts was 5.0 g and 6.7 g, and they contained up to 1044 and 1218 prey items respectively (Whitacre 1992). Collins & Landy (1968 reported masses of Hymenoptera (72.4% of one species of winged ant) in the “throat” (=oesophagus) of two adult Black Swifts collected at night near nests in Veracruz, Mexico. Captured individuals of several swifts in both *Cypseloides* and *Streptoprocne* readily regurgitated masses of insect food, 35–100% again being winged ants (Foerster 1987, Marin & Styles 1992, Whitacre 1992, Collins unpublished). Other swarming insects as fig-wasps (Hymenoptera, Blastophagidae) and termites (Isoptera) were also prominent in some food samples (Collins 1968, Whitacre 1992, Marin & Styles 1992).

The preponderance of swarming insects, particularly lipid-rich winged ants, in the diets of *Cypseloides* and *Streptoprocne* swifts ranging in size from 20 to 180 g body mass suggests that the Cypseloidinae are foraging specialists feeding on prey that occur in dense, but possibly widely dispersed, patches. These swifts would be expected to forage over wider ranges than other swifts (Chaeturinae, Apodinae) to locate such food sources. This seems to be true for several species of *Cypseloides* (Collins pers. obs.) and has been confirmed by radio telemetry for *Streptoprocne* (Whitacre 1992). The ability to bring back in the oesophagus larger quantities of food, than could be accommodated as individual boluses carried in the mouth, would seem to involve a critical morphological adaptation enabling these swifts to utilize both distant and patchily distributed prey resources. I suggest that a single large mass of food carried in the oesophagus can be used to provision a chick in the form of multiple feedings at one time, or sequential feedings over an extended period of time, thereby compensating for the infrequent feeding trips to the nest which is typical of these swifts.

Recent observations support these suggestions. On 19 July 1997, at a breeding colony of Black Swifts located at Mosse Brae Falls near Dunsuir, Siskiyou Co., California, an adult returned to the nest at about 19.40 local time. Shortly afterwards it was seen to make open-mouth gaping and stretching motions. The mouth was